DATA SHEET

TDA1553Q
2 x 22 W BTL stereo car radio power amplifier with loudspeaker protection

Product specification
File under Integrated Circuits, IC01

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Philips Semiconductors

PHILIPS

2 x 22 W BTL stereo car radio power amplifier with loudspeaker protection

TDA1553Q

GENERAL DESCRIPTION

The TDA1553Q is an integrated class-B output amplifier in a 13-lead singe-in-line (SIL) plastic power package.
The circuit contains 2 x 22 W amplifiers in Bridge Tied Load (BTL) configuration. The device is primarily developed for car radio applications.

Features

- Requires very few external components
- High output power
- Low offset voltage at outputs
- Fixed gain
- Good ripple rejection
- Mute/stand-by switch
- Load dump protection
- AC and DC short-circuit-safe to ground and V_P
- Loudspeaker protection (LSP)
- Thermally protected
- Reverse polarity safe
- Capability to handle high energy on outputs (V_P = 0 V)
- Protected against electrostatic discharge
- No switch-on/switch-off plop
- Low thermal resistance
- Flexible leads

QUICK REFERENCE DATA

PARAMETER	CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply voltage range						
operating		V_P	6.0	14.4	18.0	V
non-operating		V_P	–	–	30	V
load dump protected		V_P	–	–	45	V
Repetitive peak output current		I_{ORM}	–	–	4	A
Total quiescent current		I_{tot}	–	80	160	mA
Stand-by current		I_{sb}	–	0.1	100	μA
Switch-on current		I_{sw}	–	–	60	μA
Input impedance		$\|Z_I\|$	50	60	75	kΩ
Junction temperature		T_j	–	–	150	°C
Stereo application						
Output power	R_L = 4 Ω; THD = 10%	P_o	20	22	–	W
Supply voltage ripple rejection	R_S = 0 Ω					
	f = 100 Hz to 10 kHz	RR	48	–	–	dB
DC output offset voltage		$\|\Delta V_O\|$	–	–	150	mV
Channel separation		α	40	–	–	dB
Channel unbalance		$\|\Delta G_v\|$	–	–	1	dB

PACKAGE OUTLINE

13-lead SIL-bent-to-DIL; plastic power (SOT141R); SOT141-6; 1996 July 24.

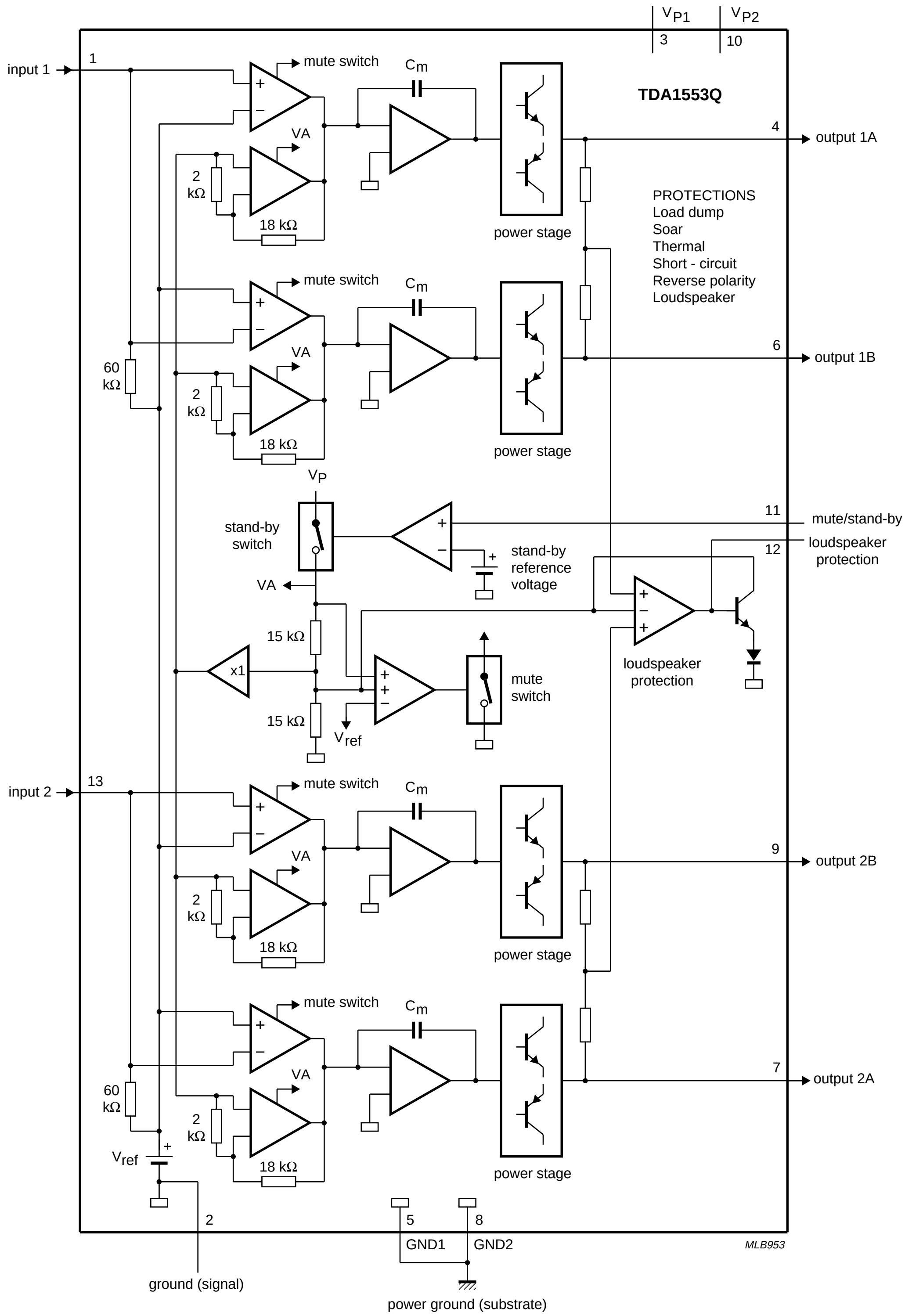


Fig.1 Block diagram.

PINNING

1	IP1	input 1
2	GND	ground (signal)
3	V_{P1}	positive supply voltage 1
4	OUT1A	output 1A
5	GND1	power ground 1 (substrate)
6	OUT1B	output 1B
7	OUT2A	output 2A
8	GND2	power ground 2 (substrate)
9	OUT2B	output 2B
10	V_{P2}	positive supply voltage 2
11	M/SS	mute/stand-by switch
12	LSP	loudspeaker protection
13	IP2	input 2

FUNCTIONAL DESCRIPTION

The TDA1553Q contains two identical amplifiers with differential input stages and can be used for bridge applications. The gain of each amplifier is fixed at 26 dB. Special features of this device are:

Mute/stand-by switch

- low stand-by current (< 100 μA)
- low mute/stand-by switching current (low cost supply switch)
- mute facility.

Loudspeaker protection

When a short-circuit to ground is made, which forces a DC voltage across the loudspeaker of ≥ 1 V, a built-in protection circuit becomes active and limits the DC voltage across the loudspeaker to ≤ 1 V. The delay time of the protection circuit can be controlled by an external capacitor connected to pin 12.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

PARAMETER	CONDITIONS	SYMBOL	MIN.	MAX.	UNIT
Supply voltage					
operating		V_P	–	18	V
non-operating		V_P	–	30	V
load dump protected	during 50 ms; $t_r \geq 2.5$ ms	V_P	–	45	V
Non-repetitive peak output current		I_{OSM}	–	6	A
Repetitive peak output current		I_{ORM}	–	4	A
Storage temperature range		T_{stg}	–55	+ 150	°C
Junction temperature		T_j	–	150	°C
AC and DC short-circuit-safe voltage		V_{PSC}	–	18	V
Energy handling capability at outputs	$V_P = 0$ V		–	200	mJ
Reverse polarity		V_{PR}	–	6	V
Total power dissipation	see Fig.2	P_{tot}	–	60	W

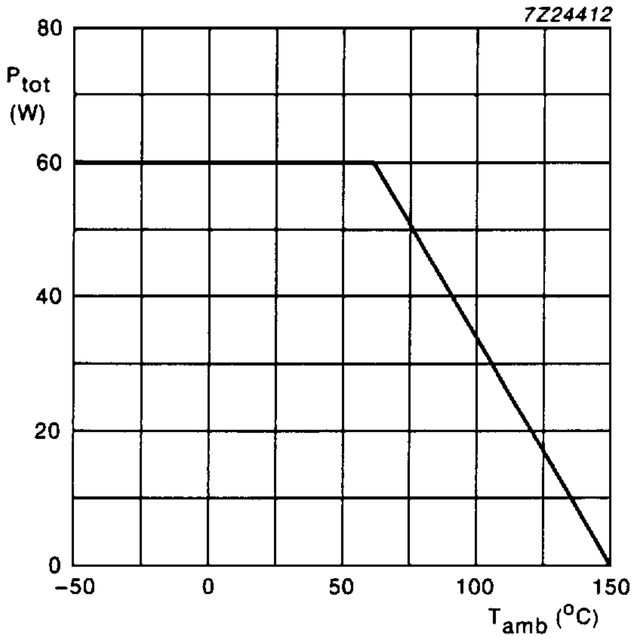


Fig.2 Power derating curve.

DC CHARACTERISTICS

V_P = 14.4 V; T_{amb} = 25 °C; measurements taken using Fig.3; unless otherwise specified

PARAMETER	CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply						
Supply voltage range	note 1	V_P	6.0	14.4	18.0	V
Total quiescent current		I_{tot}	–	80	160	mA
DC output voltage	note 2	V_O	–	6.9	–	V
DC output offset voltage		$\|\Delta V_O\|$	–	–	150	mV
Mute/stand-by switch						
Switch-on voltage level		V_{ON}	8.5	–	–	V
Mute condition		V_{mute}	3.3	–	6.4	V
Output signal in mute position	V_I = 1 V (max.); f = 1 kHz	V_O	–	–	2	mV
DC output offset voltage (between pins 4 to 6 and 7 to 9)		$\|\Delta V_O\|$	–	–	150	mV
Stand-by condition		V_{sb}	0	–	2	V
DC current in stand-by condition	V_{II} < 0.5 V	I_{sb}	–	–	100	µA
	0.5 ≤ V_{II} < 2 V	I_{sb}	–	–	500	µA
Switch-on current		I_{sw}	–	25	60	µA
Supply current	short-circuit to ground note 3	I_p	–	5.5	–	mA
Loudspeaker protection						
DC voltage across R_L						
pin 4 to pin 6		ΔV_{4-6}	–	–	1	V
pin 7 to pin 9		ΔV_{7-9}	–	–	1	V
Delay time		t_d	–	0.5	–	s
Protection active	$\|\Delta V_{4-6}\|$ or $\|\Delta V_{7-9}\| \geq 1.0$ V					
Current information		I_{12}	–	25	–	µA
Voltage information		V_{12}	2	–	–	V
Protection not active	$\|\Delta V_{4-6}\|$ and $\|\Delta V_{7-9}\| \leq 0.1$ V					
Voltage information		V_{12}	–	–	0.3	V

AC CHARACTERISTICS

V_P = 14.4 V; R_L = 4 Ω; f = 1 kHz; T_{amb} = 25 °C; measurements taken using Fig.3; unless otherwise specified

PARAMETER	CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Output power	THD = 0.5%	P_o	15	17	–	W
	THD = 10%	P_o	20	22	–	W
Output power at V_P = 13.2 V	THD = 0.5%	P_o	–	12	–	W
	THD = 10%	P_o	–	17	–	W
Total harmonic distortion	P_o = 1 W	THD	–	0.1	–	%
Power bandwidth	THD = 0.5%					
	P_o = –1 dB					
	w.r.t. 15 W	B_w	–	20 to 15000	–	Hz
Low frequency roll-off	note 4					
	–1 dB	f_L	–	25	–	Hz
High frequency roll-off	–1 dB	f_H	20	–	–	kHz
Closed loop voltage gain		G_v	25	26	27	dB
Supply voltage ripple rejection	notes 5, 6	RR	42	–	–	dB
ON	notes 5, 7	RR	48	–	–	dB
mute	notes 5, 6, 7	RR	48	–	–	dB
stand-by	notes 5, 6, 7	RR	80	–	–	dB
Input impedance		$\|Z_i\|$	50	60	75	kΩ
Noise output voltage						
(RMS value)						
ON	R_S = 0 Ω; note 8	$V_{no(rms)}$	–	70	120	μV
ON	R_S = 10 kΩ; note 8	$V_{no(rms)}$	–	100	–	μV
mute	notes 8, 9	$V_{no(rms)}$	–	60	–	μV
Channel separation		α	40	–	–	dB
Channel unbalance		$\|\Delta G_v\|$	–	–	1	dB

Notes to the characteristics

1. The circuit is DC adjusted at V_P = 6 V to 18 V and AC operating at V_P = 8.5 V to 18 V.
2. At 18 V < V_P < 30 V the DC output voltage ≤ $V_P/2$.
3. Conditions:
   a) V_{11} = 0 V
   b) short-circuit to GND
   c) switch V_{11} to MUTE or ON condition (rise time ≥ 10 μs).
4. Frequency response externally fixed.
5. Ripple rejection measured at the output with a source impedance of 0 Ω (maximum ripple amplitude of 2 V).
6. Frequency f = 100 Hz.
7. Frequency between 1 kHz and 10 kHz.
8. Noise voltage measured in a bandwidth of 20 Hz to 20 kHz.
9. Noise output voltage independent of R_S (V_I = 0 V).

APPLICATION INFORMATION

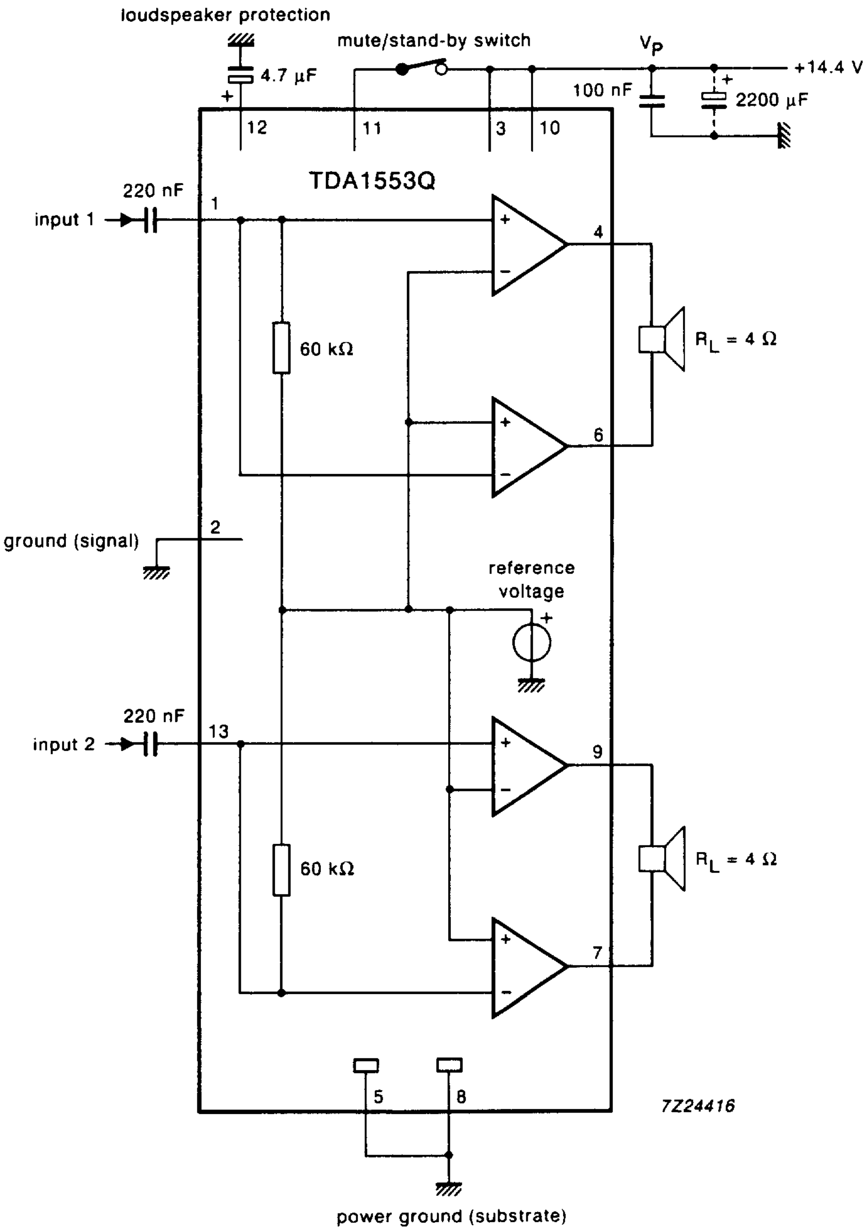
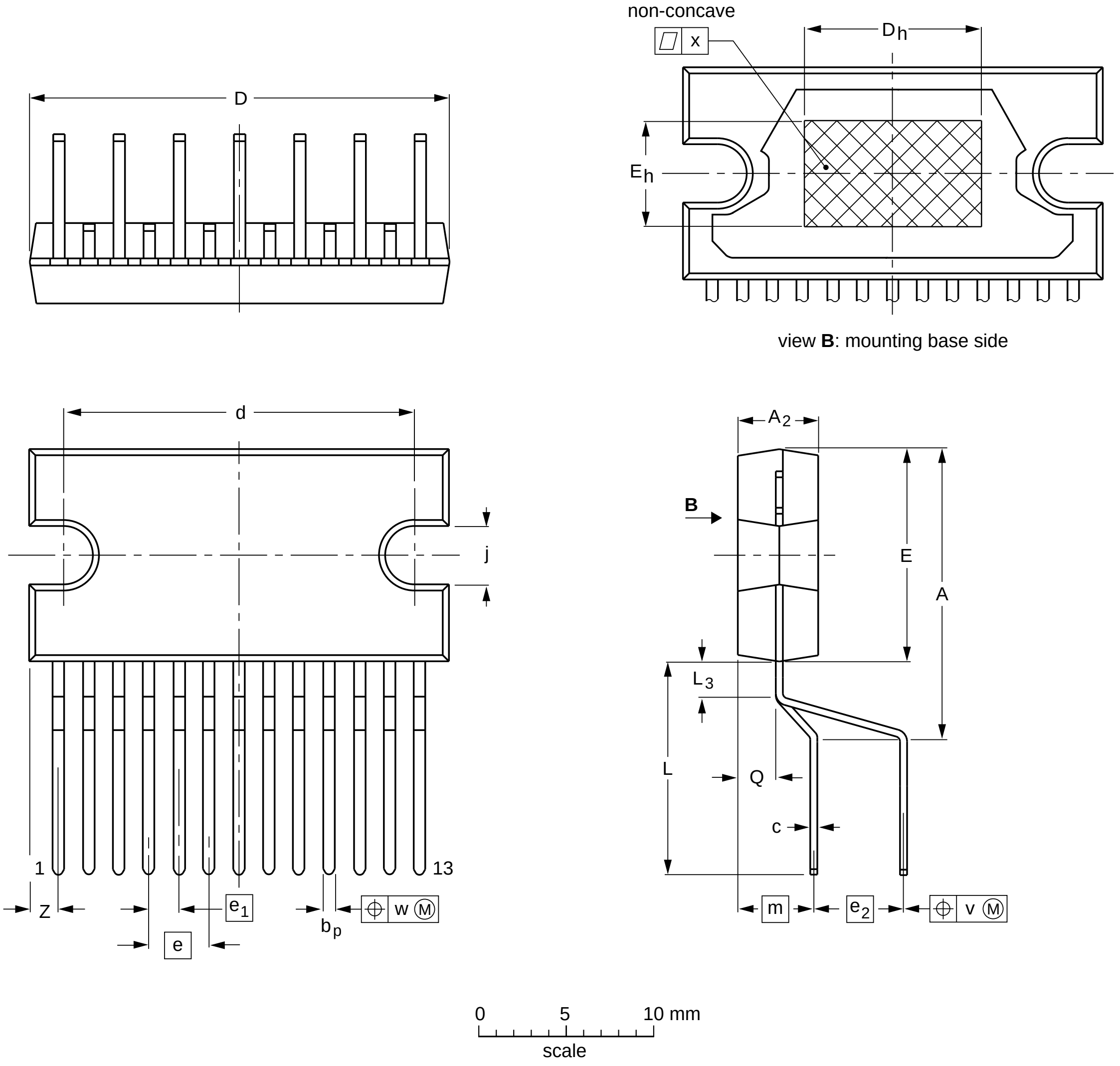


Fig.3 Application circuit diagram.

PACKAGE OUTLINE

DBS13P: plastic DIL-bent-SIL power package; 13 leads (lead length 12 mm) **SOT141-6**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_2	b_p	c	$D^{(1)}$	d	D_h	$E^{(1)}$	e	e_1	e_2	E_h	j	L	L_3	m	Q	v	w	x	$Z^{(1)}$
mm	17.0 15.5	4.6 4.2	0.75 0.60	0.48 0.38	24.0 23.6	20.0 19.6	10	12.2 11.8	3.4	1.7	5.08	6	3.4 3.1	12.4 11.0	2.4 1.6	4.3	2.1 1.8	0.8	0.25	0.03	2.00 1.45

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT141-6						~~92-11-17~~ 95-03-11

SOLDERING

Introduction

There is no soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and surface mounted components are mixed on one printed-circuit board. However, wave soldering is not always suitable for surface mounted ICs, or for printed-circuits with high population densities. In these situations reflow soldering is often used.

This text gives a very brief insight to a complex technology. A more in-depth account of soldering ICs can be found in our *"IC Package Databook"* (order code 9398 652 90011).

Soldering by dipping or by wave

The maximum permissible temperature of the solder is 260 °C; solder at this temperature must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.

The device may be mounted up to the seating plane, but the temperature of the plastic body must not exceed the specified maximum storage temperature ($T_{stg\ max}$). If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature within the permissible limit.

Repairing soldered joints

Apply a low voltage soldering iron (less than 24 V) to the lead(s) of the package, below the seating plane or not more than 2 mm above it. If the temperature of the soldering iron bit is less than 300 °C it may remain in contact for up to 10 seconds. If the bit temperature is between 300 and 400 °C, contact may be up to 5 seconds.

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.